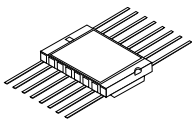
查询5962F0253401VXA供应商

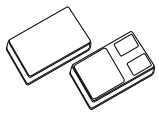
# RHFL4913
# FIXED VERSION

## RAD-HARD POSITIVE FIXED VOLTAGE REGULATORS

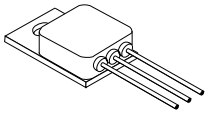
- LOW DROPOUT VOLTAGE
- EMBEDDED OVERTEMPERATURE, OVERCURRENT PROTECTIONS
- ADJUSTABLE CURRENT LIMITATION
- OUTPUT OVERLOAD MONITORING/ SIGNALLING
- FIXED 2.5; 3.3V; 5.0V OUTPUT VOLTAGES
- INHIBIT (ON/OFF) TTL COMPATIBLE CONTROL
- PROGRAMMABLE OUTPUT SHORT CIRCUIT CURRENT
- REMOTE SENSING OPERATION
- RADHARD: TESTED UP TO 300krad IN MIL 1019.5 AND LOW DOSE RATE CONDITIONS
- HEAVY IONS SEL, SEU FREE. SUSTAINS $2x10^{14}$ proton/cm$^2$, AND $2x10^{14}$ neutron/cm$^2$



**FPC-16**



**SMD.5**



**TO-257**

### DESCRIPTION

The RHFL4913 Fixed is a high performance Rad Hard Positive Voltage Regulator family.

Available into various hermetic ceramic packages, it is specifically intended for Space and harsh radiation environments. Input supply range is from 3 to 12 volts.

RHFL4913 Fixed is Qml-V Qualified, DSCC Smd are 5962F02534 / 02535 / 02536 / 02537.

### BLOCK DIAGRAM

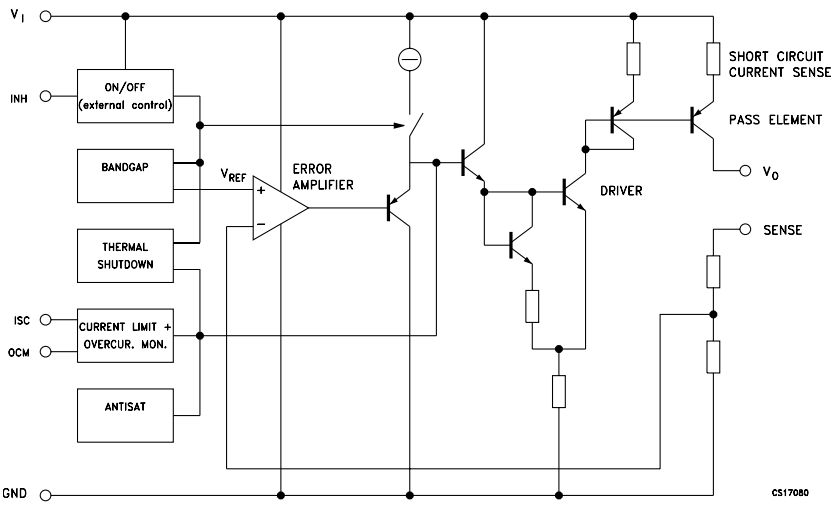


**Table 1: Absolute Maximum Ratings** (Note 1)

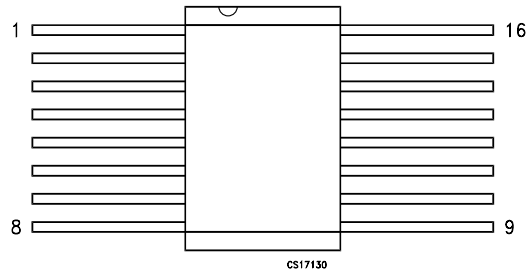
| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $V_I$ | DC Input Voltage, $V_I$ - $V_{GROUND}$ | | 14 | V |
| $I_O$ | Output Current | RHFL4913S, ESY | 3 | A |
| | | RHFL4913KP | 2 | |
| $P_D$ | $T_C$ = 25°C Power Dissipation | | 15 | W |
| $T_{stg}$ | Storage Temperature Range | | -65 to +150 | °C |
| $T_{op}$ | Operating Junction Temperature Range | | -55 to +150 | °C |
| ESD | Electrostatic Discharge Capability | | Class 3 | |

Note 1: Exceeding maximum ratings may damage the device.

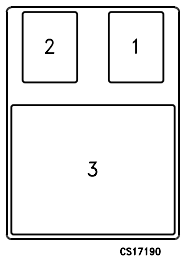
**Table 2: Thermal Data**

| Symbol | Parameter | FPC-16 | TO-257 | SMD.5 | Unit |
|---|---|---|---|---|---|
| $R_{thj\text{-}case}$ | Thermal Resistance Junction-case | 8.3 | 8.3 | 8.3 | °C/W |
| $T_{sold}$ | Maximum soldering Temperature, 10sec. | 300 | | | °C |

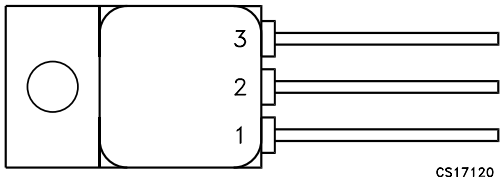
**Figure 1: Connection Diagram (Top view, Bottom view for SMD.5)**




**FPC-16**




**SMD.5**




**TO-257**

**Table 3: Pin Description**

| PIN N° | FPC-16 | SMD.5 | TO-257 |
|---|---|---|---|
| $V_O$ | 1, 2, 6, 7 | 1 | 3 |
| $V_I$ | 3, 4, 5 | 2 | 1 |
| GND | 13 | 3 | 2 |
| $I_{SC}$ | 8 | | |
| OCM | 10 | | |
| INHIBIT | 14 | | |
| SENSE | 16 | | |
| NC | 9, 11, 12, 15 | | |

**Table 4: Ordering Codes**

| FPC-16 | SMD.5 | TO-257 | SOLDER DIPPING | OUTPUT VOLTAGE |
|---|---|---|---|---|
| RHFL4913KP25-01V | RHFL4913S25-03V | RHFL4913ESY2505V | GOLD | 2.5 V |
| RHFL4913KP25-02V | RHFL4913S25-04V | RHFL4913ESY2506V | SOLDER | 2.5 V |
| RHFL4913KP30-01V | RHFL4913S30-03V | RHFL4913ESY3005V | GOLD | 3.0 V |
| RHFL4913KP30-02V | RHFL4913S30-04V | RHFL4913ESY3006V | SOLDER | 3.0 V |
| RHFL4913KP33-01V | RHFL4913S33-03V | RHFL4913ESY3305V | GOLD | 3.3 V |
| RHFL4913KP33-02V | RHFL4913S33-04V | RHFL4913ESY3306V | SOLDER | 3.3 V |
| RHFL4913KP50-01V | RHFL4913S50-03V | RHFL4913ESY5005V | GOLD | 5.0 V |
| RHFL4913KP50-02V | RHFL4913S50-04V | RHFL4913ESY5006V | SOLDER | 5.0 V |

**Table 5: Part Number - Smd Equivalence**

| ST PART NUMBER | SMD PART NUMBER |
|---|---|
| RHFL4913KP25-01V | 5962F0253401VXC |
| RHFL4913KP25-02V | 5962F0253401VXA |
| RHFL4913KP33-01V | 5962F0253501VXC |
| RHFL4913KP33-02V | 5962F0253501VXA |
| RHFL4913KP50-01V | 5962F0253601VXC |
| RHFL4913KP50-02V | 5962F0253601VXA |
| RHFL4913S25-03V | 5962F0253402VYC |
| RHFL4913S25-04V | 5962F0253402VYA |
| RHFL4913S33-03V | 5962F0253502VYC |
| RHFL4913S33-04V | 5962F0253502VYA |
| RHFL4913S50-03V | 5962F0253602VYC |
| RHFL4913S50-04V | 5962F0253602VYA |
| RHFL4913ESY2505V | 5962F0253402VZC |
| RHFL4913ESY2506V | 5962F0253402VZA |
| RHFL4913ESY3305V | 5962F0253502VZC |
| RHFL4913ESY3306V | 5962F0253502VZA |
| RHFL4913ESY5005V | 5962F0253602VZC |
| RHFL4913ESY5006V | 5962F0253602VZA |

Note: 3V version is available on request.

**Table 6: Environmental Characteristics**

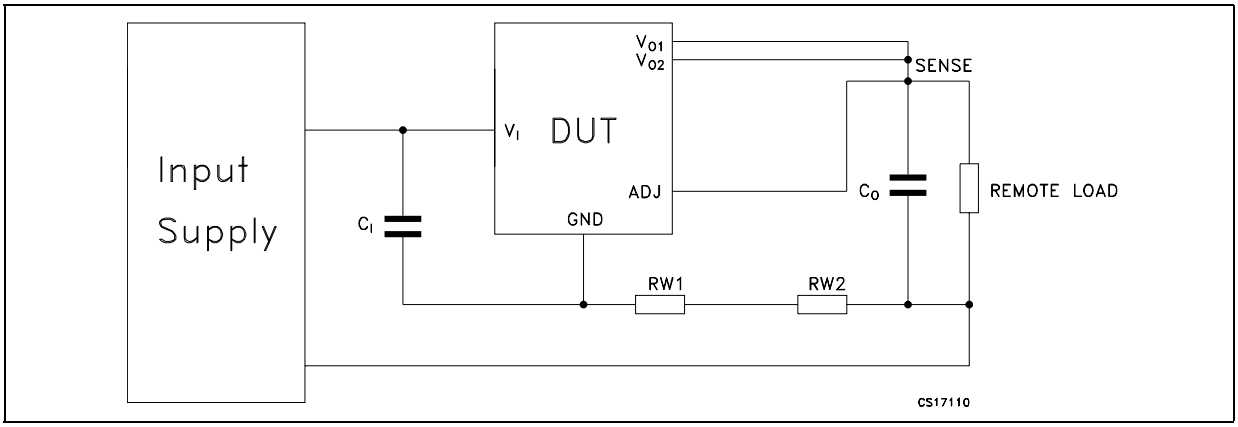
| Parameter | Conditions | Typical | Unit |
|---|---|---|---|
| Output Voltage thermal drift | -55°C to 125°C | 40 | ppm/°C |
| Output Voltage radiation drift | from 0 krad to 300 krad at 0.55rad/sec | 8 | ppm/krad |
| Output Voltage radiation drift | from 0 krad to 300 krad, Mil 1019.5 | 6 | ppm/krad |

**Table 7: Electrical Characteristics** ($T_J$ = 25°C, $V_I$ = $V_O$+2.5V, $C_I$ = $C_O$ = 1µF, unless otherwise specified)

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_I$ | Operating Input Voltage | $I_O$ = 1A $T_J$= -55 to 125°C | 3 | | 12 | V |
| $V_O$ | Output Voltage accuracy | $V_I$ = $V_O$+2.5V, $I_O$ = 5mA | -2 | | 2 | % |
| $I_{SHORT}$ | Output Current Limit (*) | Adjustable by mask/external resistor | | 4.5 | | A |
| $V_O$ | Operating Output Voltage | $I_O$ = 2 A, 2.5 V output voltage | 2.45 | | 2.55 | V |
| $V_O$ | Operating Output Voltage | $I_O$ = 2 A, 3.3 V output voltage | 3.23 | | 3.37 | V |
| $V_O$ | Operating Output Voltage | $I_O$ = 2 A, 5.0 V output voltage | 4.9 | | 5.1 | V |
| $\Delta V_O/\Delta V_I$ | Line Regulation | $V_I$ = $V_O$+2.5V to 12 V, $I_O$ = 5mA | | | 0.35 | % |
| $\Delta V_O/\Delta V_O$ | Load Regulation | $V_I$ = $V_O$+2.5V, $I_O$ = 5mA to 400 mA | | | 0.3 | % |
| | | $V_I$ = $V_O$+2.5V, $I_O$ = 5mA to 1A | | | 0.5 | % |
| $Z_{OUT}$ | Output Impedance | $I_O$ = 100 mA DC and 20 mA rms | | 100 | | mΩ |
| $I_q$ | Quiescent Current | $V_I$ = $V_O$+2.5V, $I_O$ = 5mA On Mode | | | 6 | mA |
| | | $V_I$ = $V_O$+2.5V, $I_O$ = 30mA On Mode | | | 8 | |
| | | $V_I$ = $V_O$+2.5V, $I_O$ = 300mA On Mode | | | 25 | |
| | | $V_I$ = $V_O$+2.5V, $I_O$ = 1A On Mode | | | 60 | |
| | | $V_I$ = $V_O$+2V, $V_{INH}$ = 2.4V Off Mode | | | 1 | |
| $I_q$ | Quiescent Current | $V_I$ =$V_O$+2.5V, $I_O$=5mA, $T_J$=-55 to 125°C | | | 6 | mA |
| | | $V_I$ =$V_O$+2.5V, $I_O$=30mA, $T_J$=-55 to 125°C | | | 14 | |
| | | $V_I$ =$V_O$+2.5V, $I_O$=300mA, $T_J$=-55 to 125°C | | | 40 | |
| | | $V_I$ = $V_O$+2.5V, $I_O$ = 1A, $T_J$=-55 to 125°C | | | 100 | |
| $V_d$ | Dropout Voltage | $I_O$ = 400mA $V_O$ = 2.5 to 9 V, (-55°C) | | 300 | 400 | V |
| | Dropout Voltage | $I_O$ = 400mA $V_O$ = 2.5 to 9 V, (25°C) | | 350 | 450 | |
| | | $I_O$ = 1A $V_O$ = 2.5 to 9 V, (25°C) | | | 650 | |
| | | $I_O$ = 2A $V_O$ = 2.5 to 9 V, (25°C) | | 900 | | |
| | Dropout Voltage | $I_O$ = 400mA $V_O$ = 2.5 to 9 V, (125°C) | | 450 | 550 | |
| | | $I_O$ = 1A $V_O$ = 2.5 to 9 V, (125°C) | | | 800 | |
| | | $I_O$ = 2A $V_O$ = 2.5 to 9 V, (125°C) | | 950 | | |
| $V_{INH(ON)}$ | Inhibit Voltage | $I_O$ = 5mA, $T_J$= -55 to 125°C | | | 0.8 | V |
| $V_{INH(OFF)}$ | Inhibit Voltage | $I_O$ = 5mA, $T_J$= -55 to 125°C | 2.4 | | | V |
| SVR | Supply Voltage Rejection | $V_I$ = $V_O$+2.5V ± 0.5V, $I_O$ = 5mA, f = 120Hz | 60 | 70 | | dB |
| | | $V_I$ = $V_O$+2.5V ± 0.5V, $I_O$ = 5mA, f = 33KHz | 30 | 40 | | |
| $I_{SH}$ | Shutdown Input Current | $V_{INH}$ = 5 V | | 15 | | µA |
| $V_{OCM}$ | OCM Pin Voltage | Sinked $I_{OCM}$ = 10 mA active low | | 0.38 | | V |
| $t_{PLH}$ | Inhibit Propagation Delay | $V_I$ = $V_O$+2.5V, $V_{INH}$ = 2.4 V, $I_O$ = 400 mA | ON-OFF | | 20 | µS |
| $t_{PHL}$ | | | OFF-ON | | 100 | µS |
| eN | Output Noise Voltage | B= 10Hz to 100KHz $I_O$ = 5mA to 2A | | 40 | | µVrms |

(*) This value is guaranteed by design. For each application it's strongly recommended to comply with the maximum current limit of the package used.

**Figure 2: Application Diagram For Remote Sensins Operation**




## DEVICE DESCRIPTION

The RHFL4913 Fixed Voltage contains a PNP type power element controlled by a signal resulting from amplified comparison between the internal temperature compensated Band-Gap cell and the fraction of the desired Output Voltage value. This fractional value is obtained from an internal-to-die resistor divider bridge set by STMicroelectronics. The device is protected by several functional blocks.

### Low pin count Package limitations

Some functions (INHIBIT, OCM, SENSE) are not available due to lack of pins. Corresponding die pads are by default connected inside silicon.

### SENSE pin

The Load voltage is applied by a Kelvin line connected to SENSE pin: Voltage feed-back comes from the internal divider resistor bridge. Therefore possible output voltages are set by manufacturer mask metal options. SENSE pin is not available in 3pin packages.

### INHIBIT ON-OFF Control

By setting INHIBIT pin TTL-High, the Device switches off the Output Current and Voltage. The Device is ON when INHIBIT pin is set Low. Since INHIBIT pin is internally pulled down, it can be left floating in case Inhibit function is not utilized. INHIBIT pin is not available in 3pin packages.

### Overtemperature protection

A temperature detector internally monitors the power element junction temperature. The Device goes OFF at approx. 175°C, returning to ON mode when back to approx. 40°C. It is worth noting that when the internal temperature detector reaches 175°C, the active power element can be at 225°C: Device reliability cannot be granted in case of extensive operation under these conditions.

### Overcurrent protection

$I_{SC}$ pin. An internal non-fold back Short-Circuit limitation is set with $I_{SHORT}$ > 3.8A ($V_O$ is 0V). This value can be reduced by an external resistor connected between $I_{SC}$ pin and $V_I$ pin, with a typical value range of 10kΩ to 200kΩ. This adjustment feature is not available in 3pin packages. To keep excellent $V_O$ regulation, it is necessary to set $I_{SHORT}$ 1.6 times greater than the maximum desired application $I_O$. When $I_O$ reaches $I_{SHORT}$ – 300mA, the current limiter overrules Regulation and $V_O$ starts to drop and the OCM flag is risen. When no current limitation adjustment is required, $I_{SC}$ pin must be left unbiased (as it is in 3 pin packages).

### OCM pin

Goes Low when current limiter starts to be active, otherwise $V_{OCM} = V_I$. It is bufferized and can sink 10mA. OCM pin is internally pulled-up by a 5 kΩ resistor. Not available in 3pin packages.

**Alternate to**

RHFL4913 Fixed (& custom) Voltages replace all 3-terminal Industry Devices, providing essential benefits
- Lower Drop-Out
- High radiation performance
- Better SVR
- Saving the high stability external setting resistors.

## APPLICATION INFORMATION

The RHFL4913 Fixed Voltage is functional as soon as $V_I$-$V_O$ voltage difference is slightly above the power element saturation voltage. A minimum 0.5mA $I_O$ ensures perfect “no-load” regulation.
All available $V_I$ pins must always be externally interconnected, same thing for all available $V_O$ pins, otherwise Device stability and reliability cannot be granted. All NC pins can be connected to Ground. The INHIBIT function switches off the output current in an electronic way, that is very quickly. According to Lenz’s Law, external circuitry reacts with –LdI/dt terms which can be of high amplitude in case some series-inductance exists. The effect would be a large transient voltage developed on both Device terminals. It is necessary to protect the Device with Schottky diodes preventing negative voltage excursions. In the worst case, a 14V Zener diode shall protect the Device Input.
The Device has been designed for high stability and low drop out operation: Minimum 1µF input and output tantalum capacitors are therefore mandatory. Capacitor ESR range is from 0.5 Ω to over 20 Ω. Such range turns out to be useful when ESR increases at low temperature. When large transient currents are expected, larger value capacitors are necessary.
In case of high current operation with expected short-circuit events, caution must be considered relatively to capacitors. They must be connected as close as possible to device terminals. As some tantalum capacitors may permanently fail when submitted to high charge-up surge currents, it is recommended to decouple them with 470nF polyester capacitors.
Being RHFL4913 Fixed Voltage manufactured with very high speed bipolar technology 6GHz $f_T$ transistors), the PCB lay-out must be performed with extreme care, very low inductance, low mutually coupling lines, otherwise high frequency parasitic signals may be picked-up by the Device resulting into self-oscillation. User’s benefit is a SVR performance extended to far higher frequencies.

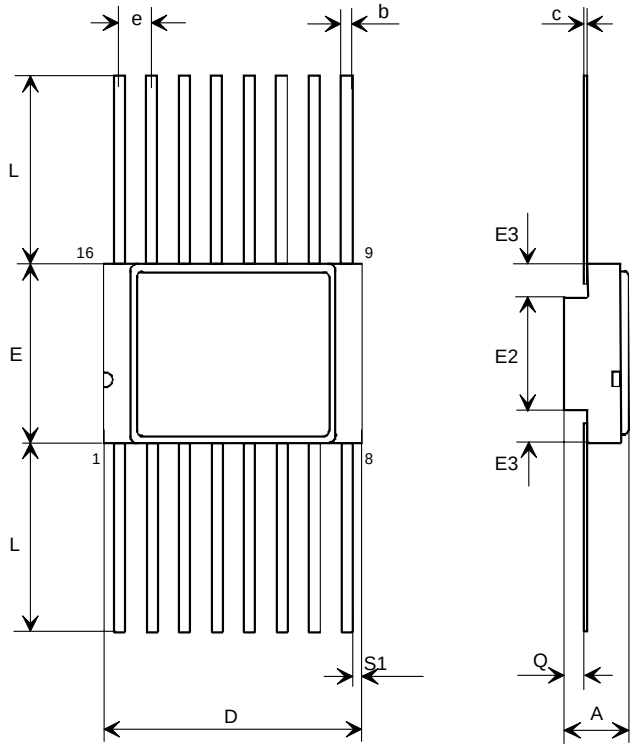
## REMOTE SENSING OPERATION

In case the Load is located far from the regulator, it is recommended to comply with the scheme below. To obtain the best regulation, it is in addition essential to care about:
- The wire connecting R2 to the Load end must not be crossed by the Load current (Kelvin sense).

The noise captured by the wires between the Load and the chip could bring a noisy output voltage. In case this happens, it is recommended that shielded cables are used for these connections. The external wrap must be used for connecting the ground of the chip with the Load Ground. It is also recommended to place 1uF tantalum capacitors between Output and Ground close to the device and another next to the Load.

## ALN FPC-16 (MIL-STD-1835) MECHANICAL DATA

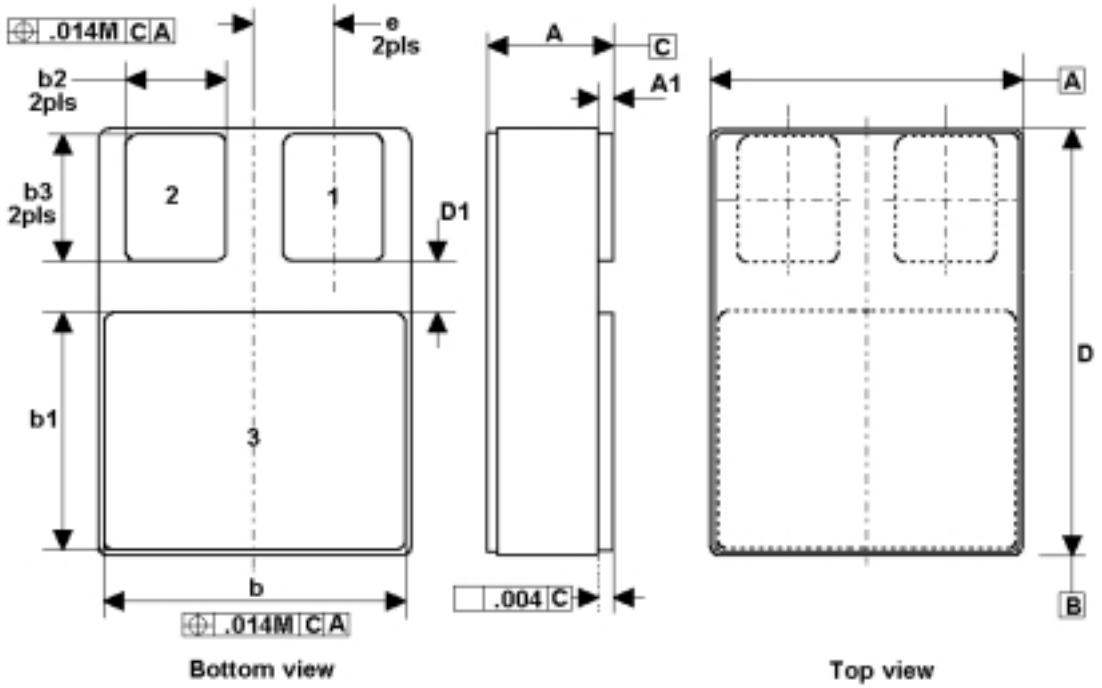
| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | 2.16 | | 2.72 | 0.085 | | 0.107 |
| b | | 0.43 | | | 0.017 | |
| c | | 0.13 | | | 0.005 | |
| D | | 9.91 | | | 0.390 | |
| E | | 6.91 | | | 0.272 | |
| E2 | | 4.32 | | | 0.170 | |
| E3 | 0.76 | | | 0.030 | | |
| e | | 1.27 | | | 0.050 | |
| L | | 6.72 | | | 0.265 | |
| Q | 0.66 | | 1.14 | 0.026 | | 0.045 |
| S1 | 0.13 | | | 0.005 | | |




7450901A

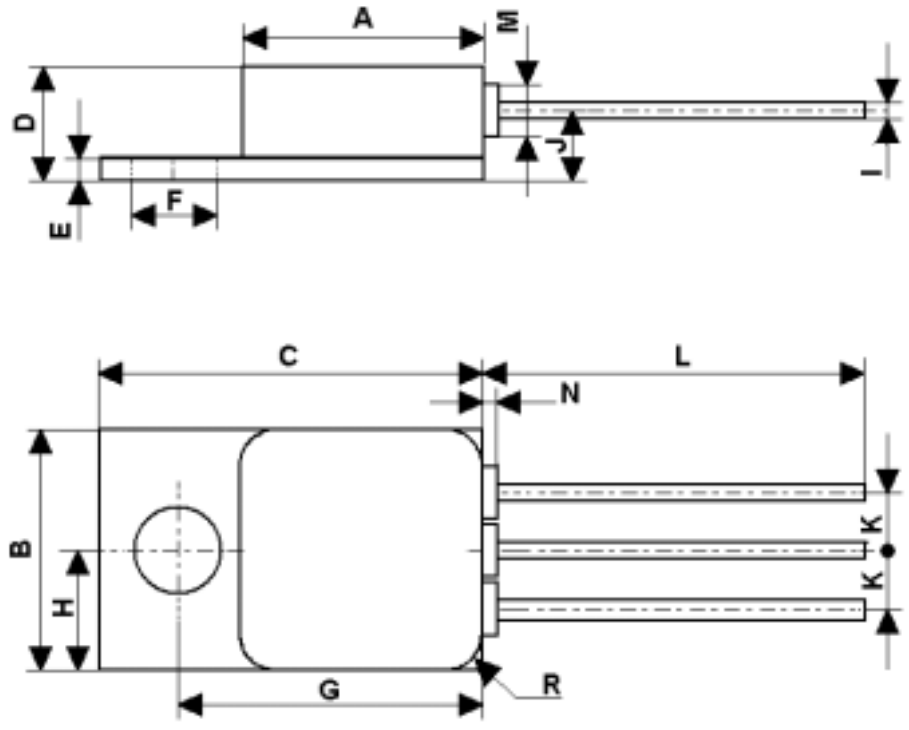
## SMD.5 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | 3.00 | | | 0.118 | |
| A1 | | 0.38 | | | 0.015 | |
| b | | 7.26 | | | 0.286 | |
| b1 | | 5.72 | | | 0.225 | |
| b2 | | 2.41 | | | 0.095 | |
| b3 | | 3.05 | | | 0.120 | |
| D | | 10.16 | | | 0.400 | |
| D1 | 0.76 | | | 0.030 | | |
| E | | 7.52 | | | 0.296 | |
| e | | 1.91 | | | 0.075 | |



# TO-257 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| A | | 10.54 | | | 0.415 | |
| B | | 10.54 | | | 0.415 | |
| C | | 16.64 | | | 0.655 | |
| D | 4.7 | | 5.33 | 0.185 | | 0.210 |
| E | | 1.02 | | | 0.40 | |
| F | 3.56 | 3.68 | 3.81 | 0.140 | 0.145 | 0.150 |
| G | | 13.51 | | | 0.532 | |
| H | | 5.26 | | | 0.207 | |
| I | | 0.76 | | | 0.030 | |
| J | | 3.05 | | | 0.120 | |
| K | | 2.54 | | | 0.100 | |
| L | 15.2 | | 16.5 | 0.598 | | 0.650 |
| M | | 2.29 | | | 0.090 | |
| N | | | 0.71 | | | 0.028 |
| R | | 1.65 | | | 0.065 | |




0117268C

**Table 8: Revision History**

| Date | Revision | Description of Changes |
|---|---|---|
| 05-May-2004 | 5 | Mistake in Pin description SMD.5 on Table 3 |

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